

REMARKS

Claims 1–16 and 21–37 are pending in the present application, where claims 6–8, 10–11, 15 and 16 have been withdrawn from consideration. By this amendment, claims 2, 21, 26 and 34 have been cancelled, and claims 1, 3, 4, 12–14, 22, 25, 27, 28 and 33 have been amended. Although claim 15 is currently withdrawn, it has also been amended. Accordingly, claims 1, 3–5, 9, 12–14, 22–25, 27–33 and 35–37 are currently under consideration. Applicant respectfully submits that these claims are allowable.

Drawing Objections

The examiner objected to the drawings for allegedly not showing a step opposing a portion of the at least one set of grooves of claims 2 and 14. Applicant has cancelled claim 2. Applicant has deleted *“disposed at least in part across the journal from the at least one set of fluid dynamic grooves”* from claim 14. Applicant requests withdrawal of the drawing objections.

Claim Objections

The examiner objected to claims 26 and 34. The examiner objected to claim 26 for allegedly failing to further limit claim 25. Applicant has amended claim 25 to include an *“end surface”* and cancelled claim 26. The examiner also objected to claim 34 for allegedly failing to define a structural limitation of claim 33. Applicant has amended claim 33 to include the limitations of claim 34 and cancelled claim 34. Applicant requests withdrawal of the claim objections.

Claim Rejections - 35 U.S.C. § 112, second paragraph

The examiner rejected claims 12–14 and 29–37 under 35 U.S.C. § 112, second paragraph, for usage of the word *“journal.”* Applicant has adopted the examiner’s suggestion of replacing *“journal”* with *“gap.”* Applicant requests withdrawal of the section 112 rejections of claims 12–14 and 29–37.

Claim Rejections - 35 U.S.C. § 102

Claims 1, 2, 4, 5, 9, 21–28 were rejected under 35 U.S.C. § 102(b) as anticipated by Moritan et al. USPN 5715116 (hereinafter “Moritan”). Claims 12–14 and 29–37 were also

rejected under 35 U.S.C. § 102(b) as anticipated by Moritan. Claims 2, 21, 26 and 34 have been cancelled.

Moritan Does Not Teach or Suggest Claim 1 as Amended

Applicant has amended claim 1 to recite:

*A fluid dynamic bearing system comprising:
a stationary sleeve;
a rotating shaft axially disposed through the sleeve;
a journal gap between the shaft and sleeve, said gap defined by first and second interfacial surfaces between the shaft and sleeve;
at least one set of fluid dynamic grooves formed on the first interfacial surface of the journal gap; and
at least one step defined on the second interfacial surface of the journal gap and extending in a non-axial direction, wherein the at least one step reduces the journal gap in a localized region, and wherein the sleeve and shaft are operable to move axially relative to each other during operation by, at least in part, hydraulic force generated by interaction of the at least one set of fluid dynamic grooves and the step with a fluid disposed in the gap, such that the at least one step moves away from an apex of the at least one set of fluid dynamic grooves;
such that the hydraulic force maintains the stationary sleeve and the rotating shaft in an substantially fixed relative axial position with respect to each other during operation despite viscosity changes in the fluid which would otherwise cause the stationary sleeve and the rotating shaft to move from the substantially fixed axial position.*

The amendment to claim 1 is supported by, for example, paragraphs [0026]-[0029], and [0032] of the application as filed.

Applicant respectfully submits that Moritan does not teach or suggest a bearing system recited by claim 1 as amended. Specifically, Moritan does not teach or suggest “*the sleeve and shaft are operable to move axially relative to each other during operation by, at least in part, hydraulic force generated by interaction of the at least one set of fluid dynamic grooves and the step with a fluid disposed in the gap, such that the at least one step moves away from an apex of the at least one set of fluid dynamic grooves; such that the hydraulic force maintains the*

stationary sleeve and the rotating shaft in an substantially fixed relative axial position.” Instead, Moritan has physical restraints of a thrust plate and a cap preventing its shaft and sleeve from moving axially relative to each other.

At one end of the shaft, Moritan teaches a thrust bearing with a thrust plate abutting, i.e. making contact with, an end of a shaft. Moritan teaches a spindle motor with a contact thrust bearing between the thrust plate and the shaft.

“However, the above-mentioned dynamic pressure fluid bearing itself does not have an ability as a thrust load bearing, and hence the conventional dynamic pressure fluid bearing for the memory disk driving apparatus has used another thrust bearing. Among various types of thrust bearings, a concise and frequently used configuration comprises a thrust plate and a point contacting top face of the shaft.” (Col. 1, lines 53-60) (Emphasis added.)

The term “thrust plate” is defined by Moritan to be a member in contact with a shaft.

“The thrust plate is the member which faces and contacts the thrust end of the shaft to receive the thrust load, and in case of the thin type spindle motor for driving the memory disk, this member is of course a plate shaped member and hence is herein called the thrust plate in the disclosure.” (Col. 4, line 66 – col. 5., line 3.) (Emphasis added.)

Within this context, Moritan teaches a rotor including the thrust bearing having the thrust plate making contact with an end of the shaft.

“a thrust bearing including a thrust plate disposed at one end of the sleeve for abutting the end portion of the shaft and a predetermined amount of oil confined in a closed space which is formed by the sleeve, the end portion of said shaft and the thrust plate have a connection path to outside open space.” (Col. 3, lines 36-41) (Emphasis added.)

This configuration is shown, for example, in Figures 1(c), 2(a), 3(a), and 4(a) of Moritan.

Therefore, Moritan teaches a thrust plate 22 point contacting, i.e. abutting, an end of a shaft 12, so the shaft 12 is in a fixed axial position relative to the thrust plate 22. In addition, the thrust plate 22 is axially fixed relative to the sleeve 21 because the thrust plate 22 and the sleeve 21 are both fixed to the housing (hollow cylinder) 23a.

“Then, the sleeve 21 is fit in and fixed on the inner wall of a hollow cylinder 23a at the center of the bracket 23. (Hereinafter, the hollow cylinder 23a is called "housing".) Subsequently, the thrust plate 22 is fixed at the bottom face of the housing 23a by means of caulking. Instead of the caulking, press-fit can be applied.” (Col. 1 lines 10-16.) (Emphasis added.)

At the other end of the shaft 12, Moritan teaches a cap 26 preventing axial movement of the shaft 12. The shaft 12 is attached to a hub 11.

“Among the rotor assembly 10, an upper part of the shaft 12 is firmly fixed at the center hole of the hub 11 by means of a shrinkage fit. Then, the inner circular face of the rotor frame 13 is fit on a fastening convex of the hub 11, and is firmly fixed by means of caulking.” (Col. 8 lines 17-21.)

A cap 26 is placed on the shaft 12 to form an upper assembly 15.

“Subsequently, a cap 26 is inserted from the lower end side of the shaft 12, and the inner edge of the circular hole of the cap 26 is loosely placed in a groove 12c of the shaft. Thus, an upper assembly 15 is worked up.” (Col. 8 lines 23-27.)

The cap 26 attaches the upper assembly 15 to the lower assembly 10 by a shrink fit on a housing 23a.

“And then, the lower end side of the shaft 12 of the upper assembly 15 is inserted into the hole of the sleeve of the lower assembly 10. At this time, inner wall of the cylindrical part of the cap 26 is designed to have some shrink range against the outer wall of the housing 23a. Therefore the cap 26 can be smoothly pushed so that the lower face of the top part of the cap 26 touches the upper end of the housing 23a,” (Col. 8 lines 29-35.) (Emphasis added.)

Therefore, the cap 26, by its shrink attachment to the lower assembly 10, prevents axial movement of the shaft 12 away from the thrust plate 22.

Since Moritan teaches physical restraints of the thrust plate 22 and the cap 26 preventing axial movement of both ends of its shaft 12, Moritan fails to teach or suggest claim 1 as amended. Therefore, Applicant requests withdrawal of the section 102 rejection against independent claim 1 and its dependent claims 4, 5, 9, 22-25, 27, and 28.

Moritan Does Not Teach or Suggest Claim 12 as Amended

Applicant has amended claim 12 to recite:

*A fluid dynamic bearing motor comprising:
a stationary sleeve;
a shaft and hub rotatable in relation to the sleeve;
a gap defined between the sleeve and the shaft;
a fluid bearing means between the sleeve and the shaft; and
a pressure regulating means cooperating with and
opposing the fluid bearing means across the gap therefrom to
generate hydraulic force by interaction with a fluid disposed
between the fluid bearing means and the pressure regulating
means to maintain proper axial alignment of the shaft and hub
with the sleeve, wherein the shaft and the stationary sleeve are
operable to move relative to each other in response to the
hydraulic force such that the pressure regulating means moves
axially during operation away from an apex of the fluid bearing
means such that the hydraulic force maintains the stationary sleeve
and the rotating shaft in a substantially fixed relative axial position
with respect to each other during operation despite viscosity
changes in the fluid, wherein the viscosity changes would
otherwise cause the stationary sleeve and the rotating shaft to
move from the substantially fixed relative axial position.*

The amendment to claim 12 is supported by, for example, paragraphs [0026]-[0029], and [0032] of the application as filed.

For basically the same reasons as presented above with respect the section 102 rejections of claim 1, Moritan fails to teach or suggest claim 12 as amended. Therefore, Applicant requests withdrawal of the section 102 rejection of independent claim 12 and its dependent claims 13, 14, 29-33, 35-37.

Claim Rejections - 35 U.S.C. § 103

Claim 3 was rejected under 35 U.S.C. § 103(a) as unpatentable over Moritan in view of Sakatani et al USPN 5046863 (hereinafter "Sakatani"). Claim 3, as amended, now depends directly upon claim 1. As noted above, claim 1 should now be in condition for allowance. Therefore, claim 3 should be in condition for allowance.

CONCLUSION

In view of the above, Applicant respectfully submits that the present application is in condition for allowance and a Notice to that effect is earnestly solicited. If it is determined that a telephone conversation would expedite the prosecution of this application, the Examiner is invited to telephone the undersigned at the number given below.

In the unlikely event that the transmittal letter is separated from this document and the Patent Office determines that an extension and/or other relief is required, applicant petitions for any required relief including extensions of time and authorizes the Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to **Deposit Account No. 14-1437** referencing Docket No. 8209.034.NPUS00. However, the Commissioner is not authorized to charge the cost of the issue fee to said Deposit Account.

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Respectfully submitted,

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